

Lowell Notes

Harnessing Power

National Park Service
U.S. Department of the Interior



Lowell National Historical Park



Pawtucket Falls,
1915

Where are the falls?

In Lowell, the Merrimack River drops 32 feet over a one mile stretch of rapids. This area of the river, known as Pawtucket Falls, is located about one mile from downtown Lowell. This section of the river is diverted by the Pawtucket Dam and channeled through the Pawtucket and Northern Canals into a series of canals located throughout the city. Most of the year there are no falls in Lowell, as the water is diverted into the canals.

Water from the Merrimack River is directed to Lowell factories through a network of 5.6 miles of power canals. Hydro- mechanical energy is produced as the water drops through water wheels or turbines. The Proprietors of Locks and Canals, the company responsible for providing water power to the factories, faced

many challenges to keep the water flowing.

The Proprietors of Locks and Canals built a transportation canal around the falls in 1792. In 1822 the Proprietors looked to harness the water from the Merrimack River. Workers built the Pawtucket Dam forever altering the landscape and beginning the struggle between man and nature.

While these canals may look harmless, many dangers exist from rerouting a river through a city. Flooding is a concern. Swiftly flowing water means the possibility of being sucked into water wheels or turbines.

Harnessing “Mother Nature” proved dangerous as each season brought new challenges for the canal workers.

Spring



Repairing Pawtucket Dam 1923

Water wheels were only 60% efficient. A little over half of the money spent was returned as power. It’s like leaving the lights on when not at home. Water is money in Lowell. In spring, snow melts, rain falls and the water levels rise. Too much water in the canals, or backwater, can make the inefficient water wheels grind to a halt. High water often meant factory closures and workers lost wages.

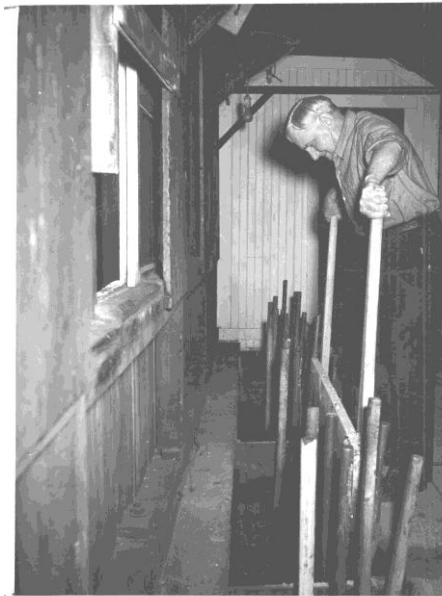
Turbine technology helped to increase the efficiency of water power in Lowell and solved the problem of spring backwater.

Turbines work effectively in backwater. Early turbines in Lowell were about 80% efficient

and changed the way mills operated during spring.

One dangerous spring job is changing the flashboards. When river levels rise, the force of the water destroys the top of the dam. The 300 iron rods bend and the plywood washes away. This escape valves allows excess water to follow the natural path of the river, diverting floods from the city and reconstituting Pawtucket Falls. The Proprietors crewmen must stand atop the granite dam and remove and replace the 300 bent rods and plywood while the water rushes around them and threatens to wash them over the dam and down the river.

Summer



Regulating the water

What happens to water levels in mid- summer? As precipitation decreases, so do water levels. Just as today when we have rolling blackouts to conserve electricity the Proprietors of Locks and Canals had to find ways to store up water for use during the dryer season.

They solved this problem by building a series of gates and dams along the Merrimack River watershed to control the flow of water and release it as needed to the cities below. Lake Winnepesaukee became a reservoir for the mills in Lowell.

This situation worked well for the factories but destroyed the livelihoods of both farmers and fisherman along the 118 miles of the Merrimack River.

Summer meant long days for canal workers. Not only did they regulate water levels throughout the work week, they kept canals clean from debris.

Every Sunday the canals were drained and workers removed the natural and man made trash that had gathered during the week. Imagine spending a hot Sunday working in the mucky canals removing trash people carelessly tossed away. Debris from anywhere along the river could get lodged in the Lowell canals. Even today your discarded coffee cup might end up in the canals, river and eventually the ocean.

Fall

In the fall, workers constantly battled heavy, wet leaves that fell in the canals and stuck to the racks protecting the intake pipes. Racks and shields

protected the turbines from the leaves, but they had to be constantly raked to prevent the turbines and water wheels from becoming clogged.

Winter



Guard Locks

Winter in New England might evoke a Currier and Ives image of the mill girls skating on the frozen canals of Lowell. Nothing is further from the truth. If the canals froze, factories would be without power. Bouncing the canals by raising and lowering

the water levels and moving ice floes with poles were measures taken to ensure the water continued to flow. Removing the heavy, slushy snow, referred to as *anchor ice*, and hard ice posed risks. Falling through the ice could mean death unless one was lucky enough to surface through another hole in the ice.

Canals Today

Although at first glance the canals in Lowell seem stagnant, look closely. Moving water means power is being produced. Most of the controls are

computerized and monitored remotely, but you will see men working the canals if you look. Even seemingly still water has potential to produce power.